October 16, 2013

Mr. Dwight Leisle
Port of Portland
7200 NE Airport Way
Portland, Oregon 97218

Re: Work Plan for Bench-Scale Sieve Test – OU2
Swan Island Upland Facility
Portland, Oregon
ECSI No. 271
1115-16

Dear Mr. Leisle:

This letter presents the work plan to complete a bench-scale sieve test to support preparation of the Remedial Design (RD) for Operable Unit 2 (the Facility or OU2) at the Swan Island Upland Facility (SIUF) in Portland, Oregon (Figures 1 and 2). The purpose of the sieve test is to assess if it is feasible to reduce the volume of soil removed to a landfill by screening out gravel that can be returned to the excavation.

BACKGROUND

The Port of Portland (Port) is under a Voluntary Cleanup Program (VCP) Agreement with the Oregon Department of Environmental Quality (DEQ) for Remedial Investigation (RI), Source Control Measures (SCMs), and Feasibility Study (FS) at the Facility (dated July 24, 2006). Unacceptable risks were identified for arsenic in soil in the Daimler exposure area of OU2 (Figure 2). An FS was prepared that identified excavation with off-site disposal as the preferred alternative. The FS noted that the soil to be excavated consists primarily of sand and gravel, and that mechanical screening may be a feasible technology to reduce the volume of soil removed to an off-site landfill. However, this technology would be feasible only if the gravel can be efficiently separated from the finer-grained soil and if the residual arsenic concentrations are acceptable. Therefore, this bench-scale sieve work plan is designed to determine the following:

- Proportion/distribution of the material to be excavated in the gravel size particle range;
- Proportion of finer-grained material that is retained in the gravel following mechanical sieving;
- Leachability of the arsenic in material to be disposed of; and
- Arsenic concentration in the finer-grained material that is retained in the gravel following mechanical sieving.

OVERVIEW

The bench-scale sieve test will consist of five tasks: (1) sample collection and field sieving; (2) laboratory sieve testing; (3) laboratory chemical analysis; (4) data evaluation; and (5) reporting. The sample collection and field sieving will be conducted during a dry period that will best replicate the expected construction work weather. In general, the overall approach will be to complete testing on two representative samples – one representing soil from 0 to 6 inches in depth and one representing soil from 6 to 12 inches in depth. The samples will be mechanically screened in the field to separate gravel from finer-grained soil (to simulate construction screening). Laboratory

mechanical sieve testing will be conducted to determine the amount of fine grained material remaining in the gravel. Laboratory chemical analysis will be conducted to determine the concentration of arsenic in the finer-grained soil remaining in the gravel portion after sieving and the concentration of leachable arsenic remaining in the finer-grained portion after sieving for waste designation purposes.

SAMPLING ACTIVITIES

Figure 3 shows the excavation area divided into 5 approximately equal areas, designated areas "a" through "e". Two sub-samples will be collected at the approximate center of each area, as shown, except that the samples in the area including the greatest hot spot concentration will be collected from approximately the historical hot spot sample location. At each location, one sub-sample will be collected from the depth range of 0 to 6 inches and one sub-sample will be collected from the depth range of 6 to 12 inches. The samples will be collected and processed using the following protocols.

- Collect the same volume of soil for each sub-sample (approximately 1 gallon or 15 pounds). As the soil is placed into the measuring container, tamp in layers to achieve similar density for each sub-sample collected.
- The material collected at the sub-sample locations must be collected to full depth of the sample interval. Take care to achieve vertical side walls, as practicable. That is, the same area should be excavated throughout the full depth of the sample interval.
- Once the full sub-sample volume has been collected, place the material in a stainless steel bowl and homogenize.
- Collect an 8-ounce sample for arsenic analysis. Label each sample: "SieveTest.#-#x" where "#-#" is the depth range in inches (either 0-6 or 6-12) and "x" is the location ("a" through "e"). These samples will provide an arsenic concentration for each of the five sample locations at both depth ranges.
- Collect the remainder of the material in a plastic sample bag, labeled as above.
- After collecting the "a" through "e" sub-samples, process the 0- to 6-inch sub-samples as follows. When complete, repeat for the 6- to 12-inch sub-samples.
    - Combine the "a" through "e" sub-samples and thoroughly homogenize.
    - Collect an 8-ounce sample for arsenic analysis. Label the sample: "CompSieveTest.#-#" where "#-#" is the depth range in inches (either 0-6 or 6-12). These samples will provide an arsenic concentration for the composite sample at both depth ranges.
    - Pass the combined sample through a decontaminated No. 4 rocker sieve. Continue sieving the material until there is no further visible material passing through the screen.
    - Weigh the material passing the No. 4 screen. Weigh the material retained on the No. 4 screen.
    - From the material passing the No. 4 sieve, collect a 32-oz. sample (four 8-oz jars). Label the sample "Minus4CompSieveTest.#-#" where "#-#" is the depth range in inches (either 0-6 or 6-12).
    - From the material retained on the No. 4 sieve, collect a 32-oz. sample (four, 8-oz jars). Label the sample "Plus4CompSieveTest.#-#" where "#-#" is the depth range in inches (either 0-6 or 6-12).
- Combine all excess material and return it to the site at sub-sample location "d". Grade/fill the remaining holes using on-site material.
- Submit all samples to the laboratory. In summary, there should be the following samples:
    - Twelve 8-oz. samples (one jar for each sample) for arsenic analysis:
        - SieveTest.0-6a through SieveTest.0-6e;

- SieveTest.6-12a through SieveTest.6-12e;
- CompSieveTest.0-6; and
- CompSieveTest.6-12.

o Four 32-oz. samples (four jars for each sample for a total of 16, 8-oz. jars) for sieve testing:

- Minus4CompSieveTest.0-6;
- Minus4CompSieveTest.6-12;
- Plus4CompSieveTest.0-6; and
- Plus4CompSieveTest.6-12.

LABORATORY TESTING

Mechanical Sieve Testing. The laboratory will conduct the following mechanical sieve testing using ASTM D6913. This procedure will identify the distribution of the finer-grained soil portion and the gravel portion after field sieving.

- On each "Minus4CompSieveTest.#-#" (2 total), conduct mechanical sieve analysis using the following sieve stack: No. 10, No. 40, No. 100, No. 200, and Pan. Retain all samples from each sieve and the pan in separate, labeled containers for follow-up chemical analysis (10 samples in total). Label each sample as follows: Minus4No.yyy.#-# where "yyy" is the sieve number on which the material was retained and "#-#" is the depth range (0-6 or 6-12).
- On each "Plus4CompSieveTest.#-#" (2 total), conduct mechanical sieve analysis using the following stack: ½-inch, No. 4, No. 10, No. 40, No. 100, No. 200, and Pan. For each sample (after obtaining all data needed for the sieve testing), combine and retain the material passing the No. 4 sieve for possible chemical analysis (2 samples total). Label each sample as follows: Plus4PNo.4.#-# where "#-#" is the depth range (0-6 or 6-12).
- From the "Minus4No.yyy.#-#" samples, create two mass-weighted samples for chemical analysis (one for each depth range). These samples will have the same mass distribution as the material passing the No. 4 sieve from the "Plus4CompSieveTest.#-#" samples. The recipe for these samples must be approved by Apex prior to creating the samples. Label each sample as follows: Plus4PNo.4.#-#.Sim where "#-#" is the depth range (0-6 or 6-12).

Chemical Analysis. Most samples will be analyzed for total arsenic. Selected samples will be analyzed for leachable arsenic using the toxicity characteristic leaching procedure (TCLP). Analyze the following samples for total arsenic by EPA Method 6010:

- SieveTest.0-6a through SieveTest.0-6e;
- SieveTest.6-12a through SieveTest.6-12e;
- CompSieveTest.0-6;
- CompSieveTest.6-12;
- Minus4CompSieveTest.0-6;
- Minus4CompSieveTest.6-12;
- Plus4PNo.4.0-6;
- Plus4PNo.4.6-12;

- Plus4PNo.4.0-6Sim; and
- Plus4PNo.4.6-12Sim.

Analyze the following samples for TCLP arsenic by EPA Method 1311/6010.

- CompSieveTest.0-6;
- CompSieveTest.6-12;
- Minus4CompSieveTest.0-6; and
- Minus4CompSieveTest.6-12.

DATA EVALUATION

The data collected from the field and laboratory testing will be evaluated as follows.

- The field sieving using the rocker sieve will simulate mechanical screening during construction. The mass of material passing and retained on the No. 4 sieve and retained on the ½-inch sieve will be used to estimate the potential cost savings if the material retained from sieving is returned to the site.
- The total arsenic results will be used to estimate the concentration and mass of arsenic in the coarse aggregate returned to the site following mechanical screening.
- The TCLP arsenic results will be used to complete waste profiling for the material disposed off-site. The disposal profiling data will be utilized for material either with or without mechanical sieving.

REPORTING

The results will be presented in a brief report that includes the following:

- Sample collection methodology and results of field sieving;
- Figure showing sample locations;
- Laboratory sieve test results;
- Laboratory chemical results;
- Evaluation of feasibility of mechanical sieving include cost/benefit analysis and arsenic concentrations in material to be returned to site;
- Waste designation analysis; and
- Recommendation for final construction approach.

The recommendation for the final construction approach will be incorporated into the RD upon concurrence from the Port.

Any questions on this work plan should be directed to the undersigned.

Sincerely,

REGISTERED PROFESSIONAL ENGINEER
15,147 PE
OREGON
OCT. 2, 1980
HERBERT F. CLOUGH
EXPIRES: DEC. 31, 2013

Herb Clough, P.E.
Principal

Michael J. Pickering, R.G.
Senior Associate Hydrogeologist

ATTACHMENTS

Figure 1 – Facility Location Map
Figure 2 – Facility Vicinity Map
Figure 3 – Sampling Plan

NOTE: Base map prepared from USGS 7.5-minute quadrangles as provided by Topozone. (1990)

0 2,000 4,000

Approximate Scale in Feet

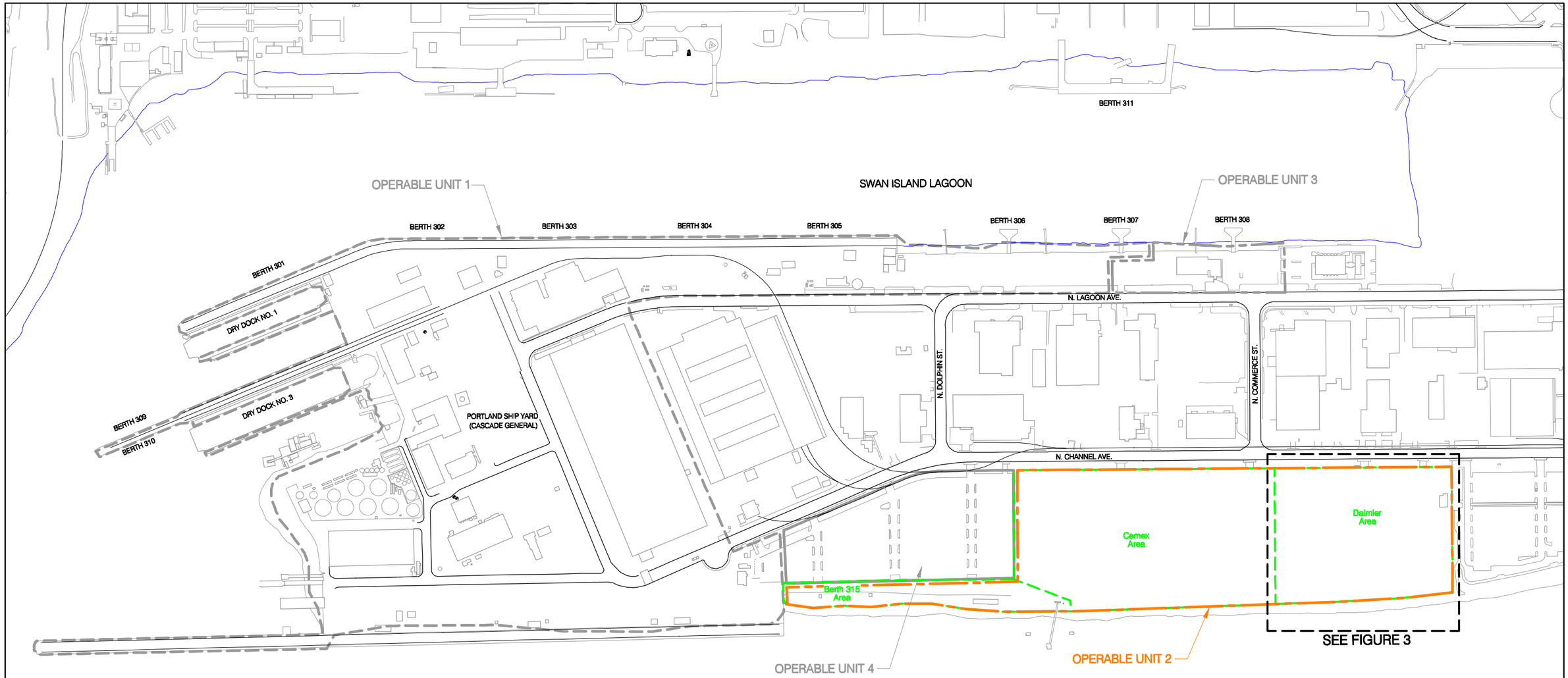
N

Facility Location Map

Sieve Test Work Plan
Swan Island Upland Facility Operable Unit 2
Portland, Oregon

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1115-16	Figure
October 2013		1



Legend:

- Operable Unit 1 Boundary
- Operable Unit 2 Boundary
- Operable Unit 3 Boundary
- Operable Unit 4 Boundary
- Exposure Area

N

0 400 800

Scale in Feet

NOTE:
1. Prepared from AutoCAD base map received from the Port of Portland in June 2007.

Facility Vicinity Plan

Sieve Test Work Plan
Swan Island Upland Facility Operable Unit 2
Portland, Oregon

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

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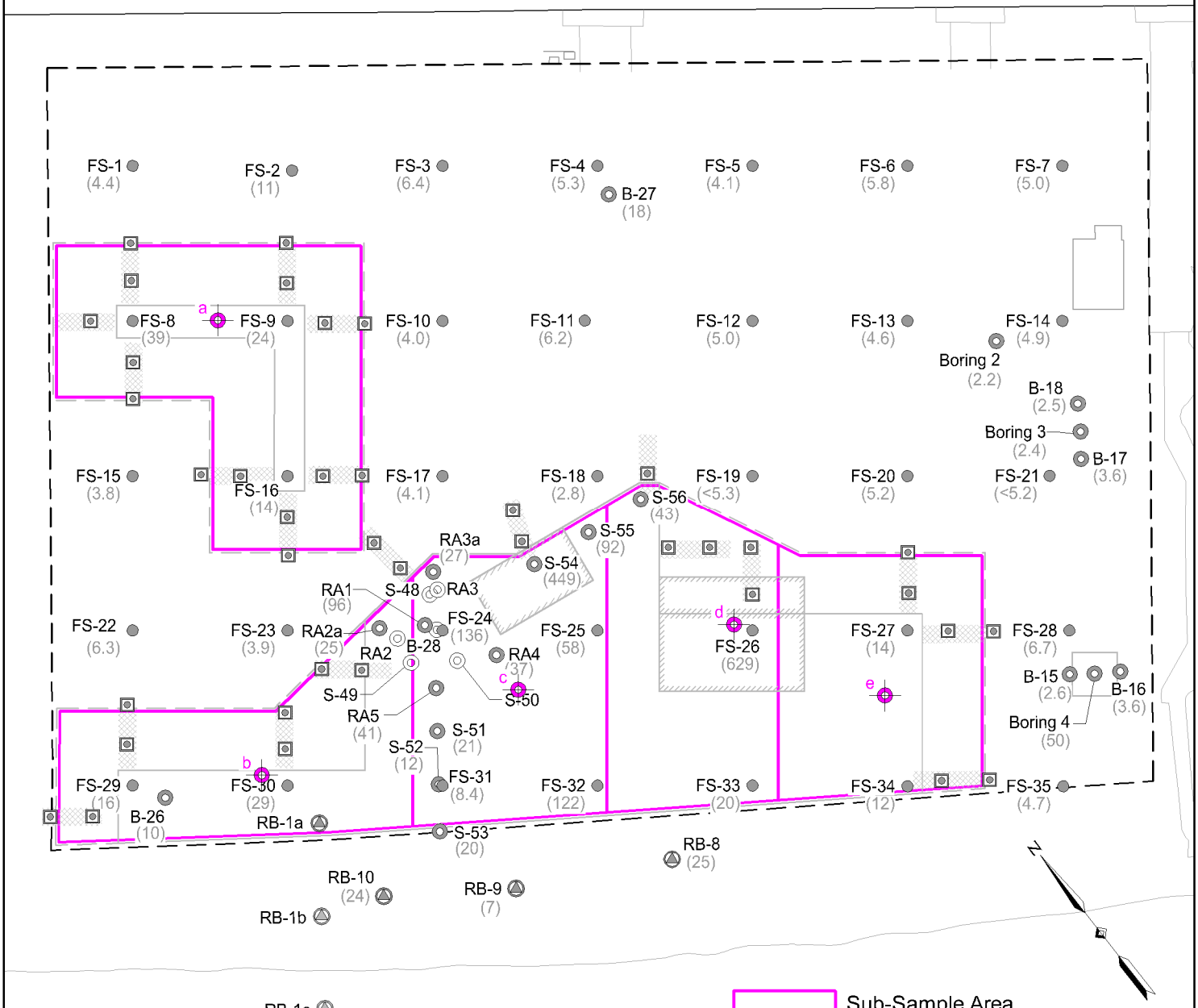

Legend:

(10) Arsenic Concentration in mg/kg

Minimum
Maximum
Estimated Range of Excavation (Estimated Depth = 0.5 to 1.5 feet)

Estimated Extent Exceeding Hot Spot Level (170 mg/kg)

FS-1 2012 Exploration Location

B-26 Soil Sampling Location

RB-1a Riverbank Soil Sampling Location

B-28 Soil Sampling Location (Soil Removed During 2006 Removal)

Daimler Trucks North America Lease Area (Approximate)

Sub-Sample Area

a Sub-Sample Location and Designation

Approximate Confirmation Sample Station Location

Approximate Confirmation Sample Location

0 100 200

Scale in Feet

NOTES:

1. Where multiple samples collected at a location, concentration shown is maximum in the depth interval of 0-3 feet.
2. Arsenic concentrations greater than the Remediation Level detected only in the 0-1 foot interval.

Sampling Plan

Sieve Test Work Plan
Swan Island Upland Facility Operable Unit 2
Portland, Oregon

APEX Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

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